results:—A globe of 32·35 c.c. capacity, filled at a pressure of 765·0 mm., and at the temperature 17·43°, weighed 0·05442 gram. The density is therefore 19·87. A second determination, made after sparking, gave no different result. This density does not sensibly differ from that of argon.

Thinking that the gas might possibly prove to be diatomic, we proceeded to determine the ratio of specific heats:—

Wave-length of sound in air	34·18
" " gas	31·68
Ratio for air	1·408
" gas	1·660

The gas is therefore monatomic.

Inasmuch as this gas differs very markedly from argon in its spectrum, and in its behaviour at low temperatures, it must be regarded as a distinct elementary substance, and we therefore propose for it the name "metargon." It would appear to hold the position towards argon that nickel does to cobalt, having approximately the same atomic weight, yet different properties.

It must have been observed that krypton does not appear during the investigation of the higher-boiling fraction of argon. This is probably due to two causes. In the first place, in order to prepare it, the manipulation of a volume of air of no less than 60,000 times the volume of the impure sample which we obtained was required; and in the second place, while metargon is a solid at the temperature of boiling air, krypton is probably a liquid, and more volatile at that temperature. It may also be noted that the air from which krypton has been obtained had been filtered, and so freed from metargon. A full account of the spectra of those gases will be published in due course by Mr. E. C. C. Baly.

"Summary of the principal Results obtained in a Study of the Development of the Tuatara (*Sphenodon punctatum*)." By ARTHUR DENDY, D.Sc., Professor of Biology in the Canterbury College, University of New Zealand. Communicated by Professor G. B. HOWES, F.R.S. Received June 15,—Read June 16, 1898.

Thanks to the most generous and freely rendered services of Mr. P. Henaghan, Principal Keeper of the Lighthouse on Stephen's Island in Cook Straits, I have lately obtained a very perfect series of Tuatara embryos, ranging in age from just before the appearance of the blastopore to about the time of hatching. I have classified these embryos in sixteen stages, and propose shortly to publish a general

account of the development with numerous illustrations. As, however, it will still take some time to complete the drawings and manuscript, it appears desirable to publish at once a short summary of the most interesting results obtained. The general development, as already stated by Thomas, conforms closely to that of other reptiles, but the following features seem to deserve special mention :—

(1) The development occupies about thirteen months, the eggs being laid (on Stephen's Island) in November and hatched about midsummer of the year following. The last stages in the development, after about the first four months, occupy a much longer period than the earlier ones, so that, having reached an already very advanced stage, the development seems to be almost if not quite suspended during the winter months.

(2) The blastoderm spreads around the yolk at a very early date, and the embryo first appears as a cap-shaped mass of cells, the front end of which is elevated above the surrounding blastoderm as the head-fold, while the hinder and narrower end is formed by an undifferentiated mass of cells representing the primitive streak. The front part of the embryo is formed of epiblast and lower layer cells, and from the lowest of the latter the hypoblast is subsequently differentiated.

(3) In the primitive streak a distinct blastopore makes its appearance, which presently opens into the enteron below, forming a very distinct neurenteric canal which persists for some time.

(4) The notochord appears to be formed by a forward growth from the primitive streak in front of the blastopore, rather than by differentiation of hypoblast cells in the mid-dorsal line of the enteron.

(5) At a very early date the front end of the embryo sinks into the yolk, pushing the subjacent blastoderm before it in such a manner that the latter forms a kind of amnion closely investing the head and the thoracic portion of the body. This "amnion," though very thin, becomes differentiated into inner somatopleuric and outer splanchnopleuric portions, but, at any rate for a long time, without any mesoblast.

(6) At a comparatively late stage in development the anterior end of the embryo, together with the somatopleuric layer of the "amnion," is withdrawn from the splanchnopleuric layer (which belongs really to the yolk sac), and thus the embryo comes to lie entirely above the yolk sac.

(7) In the hinder part of the embryo the amnion is formed by uprising folds of somatopleure meeting and fusing above the embryo, probably accompanied by a down sinking of the embryo. This process is continued backwards for some distance behind the embryo, forming a narrow canal which communicates in part with the cavity of the true amnion, and opens behind on the surface of the blasto-

derm close to the sinus terminalis. The "posterior amniotic canal" thus formed is lined by epiblast, but it lies embedded in the mesoblast of the serous envelope which gradually splits off from the underlying yolk-sac around the embryo. The posterior amniotic canal arises at a very early date, and does not persist very long.

(8) The connection between the true amnion and serous envelope (false amnion) in the mid-dorsal line persists in part to a very late stage, but there is free communication between the two halves of the pleuroperitoneal space above the embryo.

(9) In connection with the vitelline circulation, very numerous absorbing vessels are developed which dip down far into the yolk, and large transparent globules of yolk, each surrounded by a layer of yolk "crystalloids," become arranged around these vessels like onions on strings. The yolk thus gradually assumes a very characteristic radially columnar structure.

(10) The parietal eye commences its development shortly after the appearance of the optic lobes. It arises by evagination of the roof of the brain in front of the prominence of the mid-brain, and is at first situated slightly to one side of the median line (the left side, so far as yet ascertained). It very soon becomes completely disconnected from its stalk as a closed, hollow vesicle, the wall of which is composed at first of a single layer of columnar cells. The outer (upper) part of the wall of the vesicle is thickened to form the lens and the inner (lower) part presently divides into two very distinct layers, and acquires a secondary, fibrous connection with the brain immediately in front of the stalk. It is a curious fact that while the parietal eye, after separating from its stalk, at first lies on the left side—the stalk itself is median.

(11) The posterior commissure arises just *in front* of the place where the stalk of the parietal eye connects with the brain and the stalk passes forwards above it. This fact seems to exclude the possibility of the stalk of the parietal eye representing the pineal gland, for, according to Balfour, the posterior commissure arises *behind* the pineal gland which is directed backwards.

(12) The pineal gland in *Sphenodon* appears to be represented by a mass of convoluted tubules lying in front of the stalk of the parietal eye.

(13) At a late stage of development (in embryos estimated at from four to eight months) the body and part of the head are marked with very distinct longitudinal stripes of white on a grey ground. This striping almost entirely disappears before hatching, being last retained on the under surface of the head. This observation is in close agreement with those of Eimer on the markings of mammals, &c.

(14) In embryos of the same age a patch of cornified epidermis

on the snout forms a very distinct "shell-breaker," which seems to be represented in the adult by the large median scale in front of the premaxillæ.

(15) At about the time of hatching there are on each of the premaxillæ three distinct, sharp, conical teeth, of which the outermost is the largest. These probably unite later on to form the large upper cutting teeth of the adult. There are also three similar teeth on each side in the front of the mandible, which probably unite to form the lower cutting teeth of the adult. (I have not found any vomerine teeth.)

Of the above results those regarding the amnion and the parietal eye seem to be the most interesting. I had discovered and drawn the posterior amniotic canal long before I was aware of Mitsukuri's similar and previous discovery in Chelonians, and it appears to me that the observation is of especial interest in view of the supposed relationship between *Sphenodon* and the latter group, the probability of which is greatly strengthened by the striking similarity in the development of the fœtal membranes.

The development of the parietal eye in *Sphenodon* certainly supports Béraneck's important conclusion that this organ (in *Lacerta* and *Anguis*) arises independently of the epiphysis, a conclusion which was also unknown to me until after I had come to suspect the same thing from observing the peculiar relation of the stalk of the parietal eye to the posterior commissure.

I may add that owing to the scarcity of biological literature in Christchurch the works of Mitsukuri and Béraneck above referred to are only known to me from the short abstracts in the 'Journal of the Royal Microscopical Society.'

"The Stomodæum, Mesenterial Filaments, and Endoderm of *Xenia*." By J. H. Ashworth, B.Sc., Demonstrator in Zoology, Owens College, Manchester. Communicated by Professor Hickson, F.R.S. Received February 23,—Read June 16, 1898.

The specimen referred to in this note is a colony of the Alcyonaceous coral *Xenia sp. ?* from Celebes. The Xeniidæ are distinguished from all other Alcyonaria by their soft fleshy consistency and non-retractile polyps. The former character is due to the fact that their spicules are very minute rounded or oval discs (average measurements 0·015 mm. long, 0·01 mm. broad, 0·004 mm. thick), which have a horny basis impregnated with only a small quantity of calcium carbonate. The polyps have the usual Alcyonaceous structure, and